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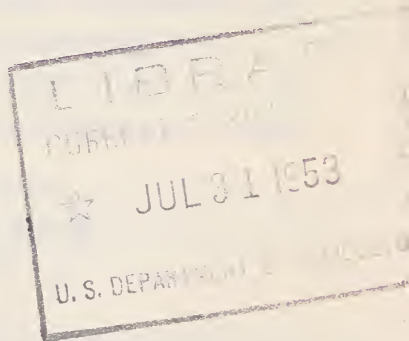
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X The
**GOLDEN
NEMATODE**;

Control
by Soil Fumigation X



**BUREAU OF
ENTOMOLOGY
and
PLANT QUARANTINE**

**Agricultural Research Administration
U. S. DEPARTMENT OF AGRICULTURE**

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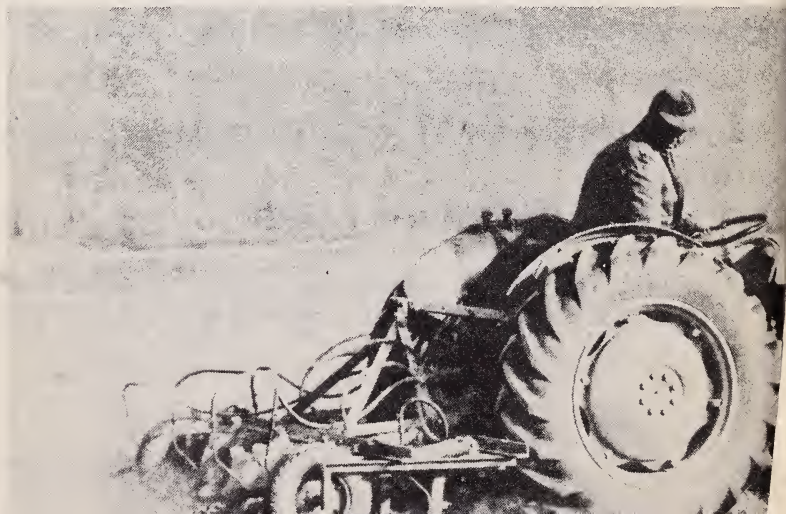
THE GOLDEN NEMATODE is one of the most difficult crop pests to control, because of its resistance to chemicals and its ability to survive in the soil for long periods in the absence of host crops.

The infrequent growing of potatoes and tomatoes, the only known host crops in the United States, will retard the build-up of nematode populations. Rotation of crops cannot be used as an eradication measure unless the host crops are excluded for many years.

Soil fumigation will reduce nematode populations, but will not eradicate an infestation. However, it is a practical measure for the control of isolated infestations. Since an isolated infestation may be endangering the crop land of the community, every effort should be made to destroy the pest and reduce the hazard of its spread.

Fumigation of large potato fields has not been found economically justifiable, as experiments indicate that the

Shank-type applicator with scotch
applying fumigant to the soil



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treatments must be made frequently. In Bureau tests in 1946 the cost of treating 1,500 acres was approximately \$85 per acre.

Fumigants and Application

Of many fumigants that have been tested for control of the golden nematode, those containing either a mixture of dichloropropene and dichloropropane (D-D mixture) or ethylene dibromide have been found the most effective and economical.

Best results are obtained when two applications are made--D-D mixture at 45 gallons and ethylene dibromide at 30 gallons per acre in each application--and the soil is plowed 5 to 10 days after the first application. The plowing buries the top 1 or 2 inches of soil, from which the fumigant escapes most rapidly, so that the second application will insure a better kill in that layer.

Shank-type applicator with scotch harrow applying fumigant to the soil.



Injector-nozzle assembly for shank-type applicator.



Preparation of Soil

The fumigant should be injected with a special applicator to half the depth of the topsoil--to 6 inches in topsoil 10 to 12 inches deep. On most soils the entire area to this depth should be prepared to the consistency of a good seed-bed with a disk, plow, or rotary tiller or some combination of such units.

If a rotary tiller is used, the soil should be allowed to settle for a few days or be compacted by rolling before the treatment is applied.

The land should be fairly moist but dry enough to be tillable. If a ball of soil barely holds its shape when compressed in the hand, its moisture content is good.

On light, sandy soil tillage before treatment is neither necessary nor desirable.

Rear view of shank-type applicator, showing tiller.



When to Fumigate

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The soil temperature should be at least 60° F., and preferably between 70° and 85°. This makes summer or fall the best time to fumigate. Then the chemical will have dissipated before planting time the next spring, so that toxic amounts will not injure plants or impart off-flavor to root crops.

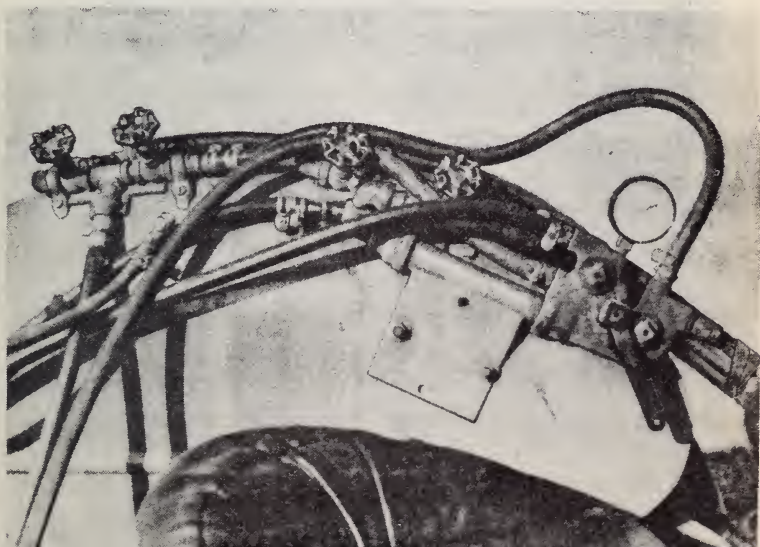
In hot, dry weather an interval of 2 months between fumigation and planting may be adequate if the soil is light and sandy. However, if there is much rain or the temperature drops after the treatment, a longer period may be necessary--even 4 months--especially on heavy soil.

Treatment of Fields

The fumigant may be applied to fields with either a shank-type or a plow-type applicator.

A shank-type applicator consists of a tiller with shanks 10 inches apart

Pressure gage, valves, multifittings, and hoses mounted on tractor fender, driver's seat in foreground.

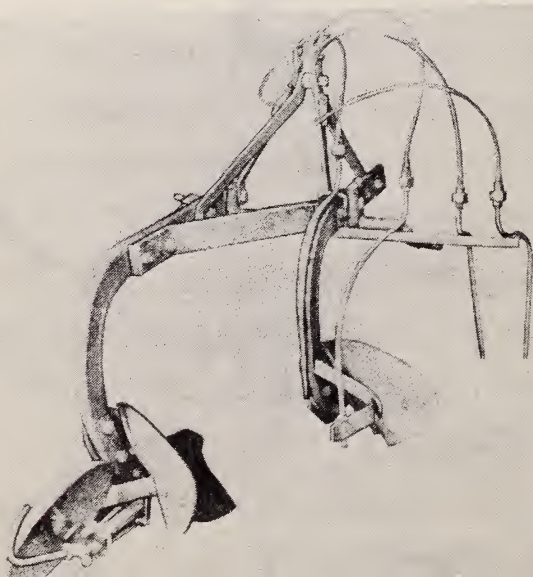


attached to the rear of a tractor that has two-way hydraulic control of the applicator, so that it can be raised or lowered to avoid breakage or dislocation of the attached metal tubing.

A soil-fumigation kit is attached to the tiller. This kit contains--

- (1) A copper-alloy pump that operates from the power takeoff.
- (2) A patented device which insures accurate application.
- (3) Six injectors with clamps for attaching to the shanks. Extra shanks and injectors may be ordered.
- (4) Injector fittings complete with strainers, check valves, and interchangeable orifices.
- (5) Chemically resistant hose designed for specific agricultural uses.
- (6) A small-nylon filter of about 30 square inches, easily visible through a glass jar.

Plow applicator showing arrangement of injection nozzles



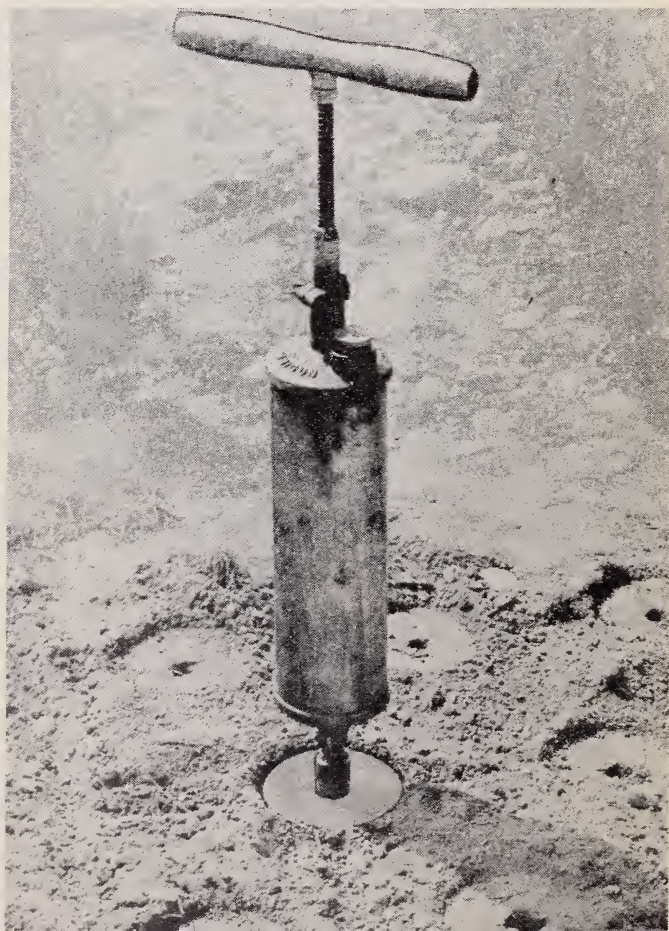
- (7) A suction-agitator pipe assembly that fits all standard drums or kegs in either horizontal or vertical mountings and lifts out as a unit.

Instructions for installing and a calibration chart are included in the kit.

Connecting tubing should preferably be of brass, copper, or a type of synthetic rubber that has been treated to withstand the chemical action of the fumigant.

A scotch harrow should be attached to the rear of the tiller to break up lumps of dirt and help make a good seal.

A 55-gallon drum is mounted on the front of the tractor (for better distribution of weight) on a platform made



of angle iron and held in place by three adjustable clamps.

After the fumigant has been applied, all lumps or clods should be pulverized and the soil surface made as smooth as possible. Sometimes it is advisable to use a heavy roller or cultipacker for this purpose.

With a plow-type applicator the fumigant is applied to an open furrow and the soil is turned over with another plowshare. It does not treat so wide an area as does the tiller applicator, but it may be more satisfactory for use in soil that contains much stubble and trash.

Treatment of Small Plots

For treating small plots of ground the fumigant may be applied with any

← A hand applicator for applying fumigants to small plots.

Seed bed prepared for application of fumigant with hand applicator.



of the hand applicators on the market. Measured quantities should be injected about 6 inches below the surface at intervals of 10 inches, and the holes immediately covered with soil. To insure accurate spacing the surface of the soil should be smoothed and then marked lengthwise and crosswise with a row marker.

Decontamination of Equipment

All equipment used for treating soil infested with golden nematodes should be thoroughly decontaminated before it is moved to another location. This is very important. It can be sterilized with steam, but fumigation with methyl bromide under a gasproof tarpaulin is more effective. The dosage of methyl bromide recommended is 23 pounds per 1,000 cubic feet for 16 hours, and the temperature should be 65° F. or above.

PRECAUTIONS

All soil fumigants are more or less toxic to humans and animals, but none are dangerous to the operator when properly handled.

Avoid prolonged breathing of the fumes, even though they may not be irritating or have a pronounced odor.

If any of the liquid gets on the skin, wash it off promptly with soap and water, and leave the area open to the air for a short time.

If you spill the liquid on your clothing, including shoes or gloves, remove the garment without delay. It is not usually advisable to wear gloves.

Be very careful not to get the liquid into your eyes or mouth. Should you swallow any accidentally, drink sufficient soapy water to induce vomiting. Should any get into your eyes, flush immediately with plain water. In either event call the nearest physician immediately.

D-D mixture will corrode metal. Therefore, applicators should be emptied after use and flushed with equal parts of lubricating oil and kerosene.

The soil-fumigation kit used by Bureau workers was obtained from Fabricated Metals, 900 33rd Ave., Oakland, Calif. However, any apparatus of a similar type should be satisfactory.

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